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X-ray Imaging of Electro-deposited Microparticles by Near-Field Coherent Diffraction. Martin de Jonge, Xianghui Xiao, Yong Chu, Qun Shen, Advanced Photon Source (APS), Argonne National Laboratory, Argonne, IL.

Coherent x-ray diffraction imaging is a potentially powerful technique for studying noncrystalline microstructures with resolution down to few-nm scales.

We report recent such studies of lead microparticles by electro-deposition onto a silicon-nitride membrane. The measurements were made using a highly-coherent x-ray beam of 8-keV at 32-ID of the APS. A pinhole was used to define an illumination region on the specimen, and further pinholes were used to remove high-order Airy rings and parasitic scattering from the illuminating beam. Coherent diffraction Images were recorded in the intermediate regime with a Fresnel number around unity. These not-so-far field diffraction patterns help to resolve the twin-image problem that exists in the far-field regime. Preliminary analysis suggests that reconstruction of these particles to ~100 nm resolution may be possible, based on images collected with a lens-coupled CCD, and to significantly higher resolutions when using a direct-detection CCD. The goal of this work is to obtain reconstructed structures at few-nm scales and to find the optimum geometry for coherent diffraction imaging experiments.

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